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Changes in mindsets of Japanese university students towards learning English with digital technologies in an English CALL course

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This research investigates students' perceptions of digital technology usage and whether a year of English language learning incorporating these technologies in a university course influences their learning attitudes. 135 participants completed questionnaires at the end of the first semester and 125 at the end of the second semester. Findings indicate that participants' attitudes toward digital technology usage appeared to shift, irrespective of their English language proficiency. However, students' attitudes towards digital technologies varied based on their English proficiency level. Lower proficiency students were more engaged in English learning via digital technology, while those with higher proficiency seemed to favor traditional paper-based learning materials. The study proposes that teachers' practices and attitudes towards digital technologies could affect students' mindsets and the observed changes.

Keywords: change in mindsets, digital technologies, English proficiency, qualitative data, teacher's attitudes

Introduction

According to the PISA 2018 results from the Organization for Economic Co-operation and Development (OECD), Japan ranks last among OECD member countries in the use of digital devices in primary and secondary education¹. This suggests that many Japanese university students have limited experience with technology-enhanced English learning prior to higher education. However, an increasing number of Japanese universities are incorporating information and communication technology (ICT), including computer-assisted language learning (CALL). This leads to the research inquiry: Can exposure to digital learning tools in a specific university course alter the attitudes of students who have primarily used paper-based materials for English instruction? Additionally, how do the practices and attitudes of their teachers towards digital technologies influence these students' attitudes?

Despite the growing body of research on digital technologies in English language learning, several gaps remain. First, while many studies have examined the effectiveness of digital tools during emergency remote teaching, particularly during the COVID-19 pandemic, fewer studies have explored how students' attitudes toward digital technologies evolve over time within a sustained, face-to-face university CALL course. Second, existing research has not sufficiently examined how learners' English proficiency levels interact with their attitudes toward digital technologies. Third, although teacher beliefs and practices are frequently discussed in CALL research, their role in shaping students' mindsets toward digital technology use has rarely been examined from a qualitative, classroom-based perspective.

To address these gaps, the present study investigates changes in Japanese university students' mindsets toward learning English with digital technologies over the course of an academic year, with particular attention to differences across proficiency levels and the influence of teachers' practices and attitudes. In the present study, the term mindset is used to refer to learners' relatively stable yet context-sensitive orientations toward learning English with digital technologies. This includes learners' beliefs about the usefulness of digital tools, their emotional responses (e.g., ease, anxiety, or resistance), and their preferred modes of engagement with learning activities.

This research is part of a three-year project initiated before the COVID-19 pandemic. The study uses a qualitative research approach with open-ended questions in a questionnaire administered twice during the course, along with multiple-choice questions. The results are expected to offer valuable insights with wide-ranging implications for English language teaching practices at all university levels.

Literature review

Previous studies on digital technologies in second language learning can be broadly categorized into three interconnected strands:

(a) learner-related factors, such as motivation, autonomy, and self-regulation;

(b) proficiency-related differences in technology use and learning outcomes; and

(c) teacher-related factors, including beliefs, instructional practices, and pedagogical decision-making.

The following review synthesizes these strands to clarify how digital technologies support English language development and how teachers' practices mediate learners' attitudes toward technology-enhanced learning.

Before the COVID-19 pandemic disrupted education systems worldwide, extensive research highlighted the profoundly positive impact of digital technologies on students' motivation, self-regulation, and self-efficacy (Lai, 2013; Shea & Bidjerano, 2010; Stelea & Girón-García, 2017; Stockwell, 2013; Ushioda, 2013; Weinberg, 2017; Youngs, 2019). Ushioda (2013) highlighted the autonomy and choice offered by mobile language learning (MLL), although she cautioned against superficial engagement due to limited development of devices and materials. Youngs (2019) made a passionate case for computer-assisted language learning (CALL) within the framework of second language acquisition (SLA) theory, emphasizing its role in increasing autonomy and motivation. Stockwell (2013) noted that teachers' effectiveness in facilitating students' skillful use of digital technologies depends on classroom conditions, including the availability of CALL systems and access to applications. These studies here suggest that introducing digital technologies should be effective to establish L2 learners' learning.

The COVID-19 pandemic catapulted digital technologies from supplementary tools to essential channels for English language learning (Fansury et al., 2020; Krishnan et al., 2020; Mahyoob, 2020; Rifiyanti, 2020; Sinaga & Pustika, 2020). This unprecedented shift has underscored the critical role of digital technology in maintaining learner motivation and autonomy in distance education (Amalia et al., 2023; Ariebowo, 2021; Panagiotidis et al., 2023). The present author's current study also found this development by highlighting the central role of digital technology in facilitating peer interactions and promoting positive English learning experiences (Toyoshima, 2022). On the other hand, Luef et al. (2019) demonstrated a significant correlation between learners' proficiency and their use of smartphone applications, with more proficient learners using a wider range of applications, while less proficient learners achieved greater proficiency gains through application use. Dashkina et al. (2022) also examined the effectiveness of computer-assisted collaborative learning, revealing differences in team dynamics and individualized learning strategies based on learner proficiency levels. Thus, the pandemic made it necessary for L2 learners to use digital technology more than before, but the effectiveness of this might depend on the learner's proficiency.

Although educators around the world have struggled with the technical demands of distance learning, often encountering gaps in required expertise (Ariebowo, 2021; Mahyoob, 2020), some students expressed dissatisfaction with instructors who did not respect their autonomy (Ariebowo, 2021), while others became disillusioned with the distance learning modality (Mahyoob, 2020). Pawlak et al. (2021) acknowledged the pervasive problem of student boredom

in online courses and suggested potential coping mechanisms. Yu (2022) highlighted the diverse skill sets in autonomous technology use and emphasized the importance of instructor support. Raine (2023) pointed out the discrepancy between instructors' beliefs and the practical implementation of CALL or technology-enhanced language learning (TELL) in the classroom. This study suggests that even though teachers' beliefs are favorable to the use of digital technologies, they may not be able to or do not use them well, and vice versa. The discussions above indicate that teachers' attitudes towards and skills of digital technologies could be one of the crucial factors to improve their students' learning and proficiency.

Several studies have emphasized that the effectiveness of digital technologies depends not only on the tools themselves but also on how teachers conceptualize and implement them in the classroom. Stockwell (2013) argued that learners' successful engagement with CALL is strongly influenced by instructional design and teacher guidance. Similarly, Raine (2023) highlighted a mismatch between teachers' positive beliefs about TELL and their actual classroom practices, suggesting that teacher agency plays a crucial role in shaping learners' experiences. These findings indicate that teachers' attitudes and pedagogical choices function as mediating factors that shape students' perceptions of digital technologies.

Throughout the COVID-19 pandemic, comparative analyses examined digital versus traditional methods of language learning (Krishnan et al., 2020; Raine, 2023). Krishnan et al. (2020) reported positive outcomes with digital English learning, while Raine (2023) found no significant difference. Despite these findings, there is a lack of research that examines learners' evolving attitudes toward digital technologies over a period. Therefore, it is crucial that the field of language learning with digital technologies continues to evolve and delve deeper into these dynamics.

Method

Research questions

Considering the previous studies discussed above, we pose the following research questions:

RQ1. Can a course using digital technologies for English learning alter students' mindsets toward the use of such technologies for language acquisition? If so, what factors influence this change in mindset?

RQ2. How do variables such as English proficiency, teacher attitudes, tasks, and materials affect students' feelings about using digital technologies, and how do these differences subsequently affect their mindsets toward learning English using these technologies?

While the concept of mindset has often been discussed in relation to Dweck's (2006) distinction between growth and fixed mindsets, particularly in achievement-related contexts, the present study does not aim to categorize learners

according to these psychological constructs. Instead, mindset is operationalized as a descriptive construct grounded in learners' self-reported experiences and reflections within a specific instructional context. This usage aligns with qualitative approaches in applied linguistics that emphasize learners' subjective meaning-making processes and evolving learning orientations over time.

Participants

The study was conducted at a Japanese university approximately 100 km from Tokyo's center, involving 135 student participants in the first and 125 in the second semester in the academic year of 2021. Their majors included educational studies/teacher licensure program, Japanese literature/linguistics, and sociology/community studies. They participated in an English course using the CALL system, and were divided into three levels based on their English proficiency, as determined by the TOEIC® Listening & Reading Test. The proficiency levels in the study correspond to the Common European Framework of References (CEFR), ranging from A1 to B1. All participants used a common textbook, Cengage's *Keynote*, American English, Level 1, 2, or 3, which varied depending on their English level (Bohike, 2017a; Bohike, 2017b; Dumett et al, 2017).

Teachers who participated in the study

In order to maintain ethical standards in their interactions with students, the authors of the study use pseudonyms, namely, Teacher A, Teacher B, and Teacher C. Each of these educators taught classes with varying levels of English proficiency. More precisely, Teacher A and Teacher C instructed students at proficiency levels between CEFR A2 and B1, while Teacher B's students were at the CEFR A1 level.

The three teachers adhered to a shared curriculum that mandated the incorporation of digital technology into their teaching using a CALL system. The objective of this integration was to bolster the advancement of the four primary language skills: listening, speaking, reading, and writing. The course encouraged collaborative learning among students via a range of pedagogical tasks. Students' progress was evaluated twice in the semester through communicative tasks. Furthermore, students were required to use an e-learning resource for self-guided learning.

Within the scope of the study, the teachers, serving dual roles as educators and researchers, shared their perspectives on various elements. They expressed their views on the integration of digital technologies for English language learning, both inside and outside the classroom, assessed the efficacy of these technologies in enhancing their students' English proficiency, and explained the rationale behind their choice of particular digital resources and learning applications, beyond the standard textbook and e-learning materials.

Research method to collect data

The present study adopted a questionnaire about learning English with technology, including multiple-choice and open-ended questions (see Appendix A). The questionnaire was administered in Japanese to ensure that participants could express their perceptions and attitudes accurately without being constrained by their English proficiency. Given that the study focused on learners' mindsets rather than linguistic performance, using the participants' first language was considered essential for eliciting rich and authentic responses, particularly from lower-proficiency learners. The participants answered the questionnaire at the end of the first and the second semester. The question categories in questionnaire (learning with technology) are as follows:

First semester:

- Experiences of learning English with technology before entering university
- Subjective perspectives of effectiveness of technology for improving English proficiency
- Preferable learning methods, e.g., technology (digital equipment, the internet applications, or e-learning) or paper-based textbook

Second semester:

- Change in impressions on learning with technology and the reasons
- Subjective perspectives of effectiveness of technology for improving English proficiency and reasons
- Preferable learning methods, e.g., technology (digital equipment, the Internet applications, or e-learning) or paper-based textbook and reasons

The present study asked participants to explain the reasons for the answers to multiple choice questions in the second semester, i.e., the end of the course, such as SSQ2, SSQ4, and SSQ6 (refer to Appendix A), investigating the results as the authentic representatives of the students' personal feeling and mindset in using digital technologies. Moreover, participants answered the questions anonymously, which would include authenticity in their words and establish trustworthiness between participants and the researchers (the present authors as their teachers). Thus, such narrative data generated from the trustworthiness should be evaluated based on authenticity and representativeness, rather than validity and reliability (Hitchcock & Hughes, 1995; Lincoln & Guba, 1985; Mishler, 1990; Toyoshima, 2007, 2018, 2020, 2022, 2024).

Research procedure

The current research is part of a two-year project, extended by an additional year owing to the COVID-19 pandemic, with the primary study carried out in 2021. Participants completed the questionnaire at the conclusion of the first and second semesters using Google Forms, after they had received an explanation about the study and consented to participate.

As for the four Likert scale questions, descriptive statistics were employed to assess responses to multiple-choice questions. In NVivo, qualitative responses were first examined using frequent word analysis to identify salient lexical patterns across groups. This was followed by contextual examination of representative excerpts to interpret how frequently occurring words reflected students’ perceptions and experiences. Rather than conducting a full inductive thematic analysis, this study adopted a descriptive qualitative approach aimed at identifying shared tendencies across proficiency levels and classes. As for the three teachers’, comments on their instruction and attitudes towards introducing digital technologies to their lessons were analyzed with content analysis following sociology’s research methodology (Toyoshima, 2007, 2018, 2020, 2022, 2024). Triangulation was achieved by comparing student responses with teachers’ reflective comments and quantitative questionnaire results.

Results

Result 1: Change in Impression on Using Digital Technologies to Learn English

The present study asked the students’ experiences of using digital technologies to learn English before entering university in the first semester because past experiences might influence their mindset in digital technologies as attribution theory argued (e.g., Brown, 2014). The result was shown depending on classes (Teachers) as follows (see Table 1):

Table 1. The students’ experiences of using technologies to learn English before entering university (FSQ1)

Teacher (English Level)	Answers				Total
	1	2	3	4	
Teacher A (CEFR A2)	10 (17%)	30 (53%)	16 (28%)	1 (2%)	57 (100%)
Teacher B (CEFR A1)	16 (32%)	26 (52%)	5 (10%)	3 (6%)	50 (100%)
Teacher C (CEFR A2-B1)	5 (18%)	14 (50%)	8 (29%)	1 (3%)	28 (100%)

Note. The answer options were 1) I have never used these devices; 2) I sometimes used these devices; 3) I often used these devices; and 4) I always used these devices.

The result showed that most of the students in the study have rarely or never used digital technologies at primary or secondary level education including outside the classroom. Particularly, it was over 80% of the group of the lowest English-proficiency level students who were exactly “novice” of using digital technologies in the beginning of the course, which meant the highest

percentage of the three groups, as well as the most “novice” English proficiency level of the three.

In the second semester, the questionnaire asked if the students’ impression on using digital technologies had changed or not. About 60–70% of the students in each group thought that their impression had changed through the course as shown in Table 2:

Table 2. The students’ change in impression on using digital technologies after the course (SSQ1)

	Answers				Total
	1	2	3	4	
Teacher A (CEFR A2)	2 (3%)	16 (25%)	40 (64%)	5 (8%)	63 (100%)
Teacher B (CEFR A1)	1 (2%)	15 (37%)	24 (59%)	1 (2%)	42 (100%)
Teacher C (CEFR A2-B1)	0 (0%)	7 (35%)	12 (60%)	1 (5%)	20 (100%)

Note. The answer options were 1) My views have not been changed at all; 2) My views have not been changed much; 3) My views have been changed in some parts; and 4) My views have been changed much.

The questionnaire asked the reason for the response to the question above (SSQ1), showing the frequent words analyzed by NVivo application:

Table 3. Frequent words included in the reason of SSQ1 (SSQ2)

Class (Teacher/ English level)	Frequent words in the reason of SSQ1
Teacher A (CEFR A2)	English, studying, learn, using, devices, digital, high, vocabulary (words)
Teacher B (CEFR A1)	English, learn, change, easy, using, become, listening, school, high, way
Teacher C (CEFR A2-B1)	listening, learning, devices, digital, high, school, use

Note. The data were analyzed using the most frequent 1,000 words, including stemmed words, and a word tree of the key word from the frequent words with weighted percentages of 2% or more with 10 context words.

The following comments were extracted as sample ones, showing the answer of SSQ1 in parentheses:

Teacher A’s students:

A1: I don’t have to open the textbook anymore, so it is easier to practice vocabulary in my spare time. (No. 4)

A2: Because by using the vocabulary cards and taking tests with the app’s features, I could find more words that I could understand the meaning of when I see English in my daily life. (No. 3)

Teacher B’s students:

B1: Because I can easily get started at any time. (No. 3)

B2: It changed me. (No. 3)

B3: My dislike of English has not changed. (No. 2)

B4: I didn't know there was such a thing as this. I just think, "This way of doing things has been increasing lately". I have not changed my mind about it. (No. 1)

Teacher C's students:

C1: I have more opportunities to do listening. (No. 3)

C2: Because I realized the importance of listening. (No. 3)

The comments suggested somewhat their changes in their mindset for positive impression on using digital technologies to learn English as shown in Table 2 above. However, some lowest English-proficiency level students in Teacher B's class revealed more negative impression by using the word, "not change", than the students in the other two classes (Comment B3 and B4). The result also identified with Table 2 above.

The questionnaire includes the questions to investigate whether the students would change their impression on effectiveness of digital technologies to improve their English proficiency through the course. In the first semester, the questionnaire asked their impression on digital technologies in terms of useful tools to improve their English proficiency (FSQ2 shown in Table 4):

Table 4. The students' impressions on digital technologies in terms of useful tools to improve their English proficiency asked in the first semester (FSQ2)

Teacher (English Level)	Answers				Total
	1	2	3	4	
Teacher A (CEFR A2)	0 (0%)	6 (11%)	40 (70%)	11 (19%)	57 (100%)
Teacher B (CEFR A1)	6 (12%)	12 (24%)	29 (58%)	3 (6%)	50 (100%)
Teacher C (CEFR A2-B1)	1 (4%)	4 (14%)	20 (71%)	3 (11%)	28 (100%)

Note. The answer options were 1) I don't think I can enjoy learning with them or feel they were effective to improve my proficiency; 2) I think I enjoy learning with them but I don't think I can feel they are effective to improve my proficiency; 3) I think I can enjoy learning with them and feel they are somewhat effective to improve my proficiency; and 4) I think I can enjoy learning with them much and feel they are effective to improve my proficiency.

The result showed that more than 80% of Teacher A's and Teacher C's students had already had positive impressions of using digital technologies to learn English in terms of improving their English proficiency, whereas more Teacher B's students who were lowest English-proficiency level had had negative impressions than those in the other two classes.

As for the second semester, a higher percentage of the lowest English-proficiency students answered they had a positive impression of using digital technologies to learn English than in the first semester, while almost the same percentage of the students in the other two classes had a positive impression as the last term (see Table 5):

Table 5. Subjective opinion about effectiveness of digital technology on students' English proficiency asked in the second semester (SSQ3)

	Answers				Total
	1	2	3	4	
Teacher A (CEFR A2)	1 (2%)	6 (9%)	34 (54%)	22 (35%)	63 (100%)
Teacher B (CEFR A1)	0 (0%)	10 (24%)	26 (64%)	5 (12%)	42 (100%)
Teacher C (CEFR A2-B1)	0 (0%)	5 (25%)	12 (60%)	3 (15%)	20 (100%)

Note. The answer options were 1) It is not effective at all; 2) It is not effective; 3) It is somewhat effective; and 4) It is effective.

The questionnaire asked in the second semester included the reason of the question about subjective opinion about effectiveness of digital technologies on the students' English proficiency. Table 6 showed the frequent words in the comments:

Table 6. Frequent words included in the reason of SSQ3 (SSQ4)

Class (Teacher/ English level)	Frequent words in the reason of SSQ3
Teacher A (CEFR A2)	English, study, listen, vocabulary, learn, time, using
Teacher B (CEFR A1)	learn, listen, useful, words, able, easy, English, much
Teacher C (CEFR A2-B1)	listening, learning, devices, digital, high, school

Note. The data were analyzed using the most frequent 1,000 words, including stemmed words, and a word tree of the key word from the frequent words with weighted percentages of 2% or more with 10 context words.

The extracts of the comments in accordance with the frequent words are shown as follows (SSQ3's answers were shown in the parentheses):

Teacher A's students:

A4: Because I could work on them in short periods of time, and by repeating them often, even in short periods of time, I was able to consolidate my knowledge. (No. 4)

A5: I am not good at associating English pronunciations from the alphabet

sequence, so I was glad that the app became a vocabulary book, and I could check the words with audio. (No. 4)

A6: Because I could study English easily with a smartphone, so I could study easily in my spare time. (No. 4)

A7: If I can do it on my cell phone, I can easily open the vocabulary app when I touch my cell phone. (No. 3)

A8: It takes more time to use a PC. (No. 1)

Teacher B's students:

B5: Because I can work on it easily at home. (No. 4)

B6: It was useful in that I could listen to audio. (No. 3)

B7: Because I didn't find it useful myself. (No. 2)

B8: I have no situations where English is useful. (No. 2)

Teacher C's students:

C3: Because I have more opportunities to develop my listening skills in particular. (No. 4)

C4: I only used MyELT (online material introduced in the other English class) for listening and MyELT, and I only used MyELT when I was presented with assignments, so I didn't use it enough to say that my English skills were improving. (No. 2)

The difference of the frequent words in each class showed the different feature of the reason for the students' subjective perspective on the effectiveness of using digital technologies, i.e., "vocabulary" and "time" answered by Teacher A's students; "easy" and "useful" by Teacher B's students; and "listening" by Teacher C's students. The comments indicate that most students of Teacher A regarded using digital technologies as learning vocabulary more effectively in their spare time, which supported the result of the answer SSQ3, i.e., more than 90% of the students agreed with the effectiveness of using digital technologies. Many of the Teacher C's students also admitted the effectiveness of using digital technologies, especially to improve listening skills though a quarter of them had the opposite impression according to the results of SSQ3 and SSQ4. Most of Teacher B's students, on the other hand, revealed their feelings of ease and usefulness to learn English with digital technologies, whereas a quarter of them felt unusefulness or had never changed their attitudes towards learning English even by using digital technologies.

As the last question, the students' preferences of English learning methods were asked both in the end of the first and the second semester. Table 7 and Table 8 showed the results obtained in each semester (FSQ3; SSQ5):

Table 7. Preferences of English learning methods in the first semester (FSQ3)

Teacher (English Level)	Answers				Total
	1	2	3	4	
Teacher A (CEFR A2)	0 (0%)	30 (53%)	22 (38%)	5 (9%)	57 (100%)
Teacher B (CEFR A1)	3 (6%)	20 (40%)	25 (50%)	2 (4%)	50 (100%)
Teacher C (CEFR A2-B1)	3 (11%)	15 (53%)	9 (32%)	1 (4%)	28 (100%)

Note. The answer options were: 1) I want to study only with a textbook or other paper-based materials; 2) I don't mind studying with technology partially but I want to use textbook or paper-based materials mainly; 3) I want to study by using my favorite applications or e-learning; and 4) I don't want to use textbook or paper-based materials but to use only technology.

Table 8. Preferences of English learning methods in the second semester (SSQ5)

Teacher (English Level)	Answers				Total
	1	2	3	4	
Teacher A (CEFR A2)	3 (5%)	34 (54%)	25 (40%)	1 (1%)	63 (100%)
Teacher B (CEFR A1)	1 (2%)	17 (42%)	21 (51%)	2 (5%)	42 (100%)
Teacher C (CEFR A2-B1)	2 (1%)	11 (55%)	7 (35%)	0 (0%)	20 (100%)

Note. The answer options were: 1) I want to study only with a textbook or other paper-based materials; 2) I don't mind studying with technology partially but I want to use textbook or paper-based materials mainly; 3) I want to study by using my favorite applications or e-learning; and 4) I don't want to use textbook or paper-based materials but to use only technology.

As seen in both the results, the percentage of each option was almost the same between them; that is, Teacher A's and Teacher C's students preferred a traditional paper-based way of learning to a digital one, whereas Teacher B's students preferred digital learning to paper-based. The results suggested that their mindset in learning English with digital technologies had rarely been changed through the course, even though more students of all the classes showed positive impressions of using digital technologies to improve their English proficiency. The reason for their answer was asked in the second semester (SSQ6). Table 9 showed the frequency words included in the reasons:

Table 9. Frequent Words Included in the Reason of SSQ5 (SSQ6)

Class (Teacher/ English level)	Frequent words in the reason of SSQ5
Teacher A (CEFR A2)	paper, learning, use, study, digital, textbooks, devices, easier, write, think, like
Teacher B (CEFR A1)	paper, use, digital, easier, devices, textbooks, think
Teacher C (CEFR A2-B1)	devices, digital, using, learning, think, English, paper

Note. The data were analyzed using the most frequent 1,000 words, including stemmed words, and a word tree of the key word from the frequent words with weighted percentages of 2% or more with 10 context words.

The representative answers including the frequent words were as follows (SSQ5’s answer of each student is shown in the parentheses):

Teacher A’s students:

- A9: Because both textbooks and digital devices have their own advantages, and I would like to use both flexibly. (No. 3)
- A10: It is easier to study on paper because I can write on it and touch it, and I feel like I am studying, but I cannot get into my head if I use only digital devices. (No. 2)
- A11: I am sure that applications are convenient and can be used in a short time, but I often write directly on paper media such as textbooks when I study, so I thought that textbooks and other media would be better to handle mainly. (No. 2)
- A12: Because with a digital screen, my eyes glide and it is difficult to get the content into my head. Also, I can write on paper with my own hands. (No. 2)

Teacher B’s students:

- B9: Because I thought that apps are more accessible and easier to study English than textbooks. (No. 3)
- B10: I can use my spare time more easily than with textbooks or paper-based materials. (No. 3)
- B11: With a digital device, I can’t take notes or make marks well, and I don’t feel like I’m getting the material into my head. I think it is easier to get into my head with paper because it is always at hand, I can flip through it freely, and I can write on it. Also, I don’t lose my eyesight because of the blue light. (No. 2)

Teacher C's students:

C5: Because using a digital device will increase my exposure to native English speakers. (No. 3)

C6: Because although digital devices are an attractive learning method, I don't think I can learn English only by using them. I think it would be better to increase communicative skills by using both paper and digital devices. (No. 3)

C7: Because I thought that digital devices would be disadvantageous in case of problems such as breakdowns or for those who are not familiar with using them. (No. 2)

The reasons above suggest the features of the students' attitudes towards and beliefs in learning English in terms of using digital technologies. Most students of Teacher A preferred traditional paper-based learning because they liked learning with handwriting on paper, which appeared to have been their main method which is hard to change (A10; A11). As for Teacher C's students, some showed the preference of using digital technologies (C5), but others suggested they would like to use both digital and paper-based materials to learn English, as there were some in Teacher A's class (A9; C6). However, many of Teacher B's students, the group of the lowest English-proficiency, preferred digital learning compared to paper-based through the course, even though less students admitted the effectiveness of using digital technologies to improve their English proficiency than those of the other two classes, as shown in the result of FSQ2 and SSQ3. Again, the keyword seemed to be one of the frequent words: "easy"; that is, digital technologies might make many of Teacher B's students feel easy in learning English or enable them to engage in learning English more easily than traditional paper-based learning through use of paper-based materials with handwriting (B9; B10). On the other hand, the reasons shown above revealed the common features of their preference among all the students; that is, using digital devices would be harmful for their eyesight (A12; B11) or unstable as learning tools in fear of devices' malfunction or breakdown (C7).

Result 2: The influence of teachers on the change in students' mindsets of learning English with digital technologies

In the previous section, we showed that different classes, divided by English level, have different attitudes toward using digital technology to learn English. In order to answer the second research question, whether this is related to the way the teachers in each class implemented digital technology or to their own attitudes toward digital technology, each teacher was surveyed about his/her teaching. The results are introduced below.

Teacher A's practice and attitudes

I want to give my students opportunities to use and feel comfortable with digital technologies for learning English. The goal is that of learner autonomy-students embracing the use of digital technologies for out-of-class study in a way that suits their lifestyles and/or learning styles.

One of the digital technology tools that I use, regardless of the type of English language class is “Quizlet,” an application that allows the creation and sharing of online vocabulary sets. The class textbook is arranged with each chapter focusing on a theme covered in a TED® talk. I have created a word set for each chapter and we use Quizlet at the start of each class for review and testing.

In my opinion, the primary advantage of incorporating digital technology into the classroom is that it enables students to replicate the same learning and testing tasks outside of class. Tools like Quizlet have significantly enhanced students' retention of English vocabulary, resulting in students knowing a greater number of English words by the end of the semester. However, it remains to be seen whether digital technologies like Quizlet can enhance language proficiency in real-world communication scenarios, such as conversations or emails. This area warrants further investigation.

Teacher A used a learning application, “Quizlet,” to assist her students in vocabulary acquisition both inside and outside the classroom. A significant 72% of the students in this class reported a shift in their perception of digital technology usage (see Table 2), with the term “vocabulary” frequently cited in their feedback as the reason, as the comment A2 above answered. The comment A7 also showed some positive attitudes towards using the application to learn vocabulary to improve the student's proficiency. The findings indicate that Teacher A's approach, combined with her belief in and attitude toward digital technologies, positively influences her students' mindset shift regarding vocabulary learning. This change is evident both inside and outside the classroom, facilitated by the application she introduced.

Teacher B's practice and attitudes

My students had the lowest English proficiency in the course, often expressing anxiety about learning the language at the university level. Interestingly, their comfort with digital devices had increased substantially compared to those before the COVID-19 pandemic. I used the CALL system to let the students practice communicative interactions, and the university's portal learning website to provide them with visual and aural materials of the textbook and to complete a short quiz of each unit.

I also tasked them with presenting the topics related to the textbook introduced. The task not only saw them create impressive presentation slides using various applications but also witnessed a notable boost in their confidence from the start to the end of the course. Remarkably, many

presentations highlighted their adeptness at using digital devices for gaming, suggesting that such technologies could effectively elevate their engagement in English learning beyond the classroom.

This observation led me to believe that e-learning resources, structured like games, could aid their language acquisition. Thus, I assigned them the challenging goal of completing a beginner-level e-learning module by the end of the academic year. The majority managed to accomplish the task, reaffirming my belief that increased exposure to English considerably improves proficiency and engagement.

Teacher B observed that students with the lowest English proficiency initially exhibited high anxiety towards learning the language. She speculated whether the incorporation of digital technology could alleviate this anxiety. The frequency word analysis of responses to SSQ2 revealed that “change” and “easy” were significant terms in her comments regarding her changing impressions of technology-assisted learning (see Table 2). The term “easy” suggests that initial anxiety about learning English may decrease over the course of the program, as a significant proportion of participants (76%, as shown in Table 5) are likely to experience a positive shift in mindset, and as a result, more students preferred using digital technologies to learn English compared to paper-based learning (see Table 8) by using the word “easy” frequently as their reason (see Table 9), unlike those in the other two classes.

Teacher C’s practice and attitudes

After a year of quarantine, it became harder to interact with people in person because of the need for masks. Digital technology naturally became a substitute for many activities that people did in person. These tools were helpful, but communication is better when we are together. For me, the human element is a vital part of any meaningful educational experience.

At the same time, I’ve come to appreciate how digital media can help students practice specific skills, such as grammar, vocabulary, or writing, in a focused and efficient way. At the time, I didn’t know much about digital resources beyond the usual internet content. Because of this, I mainly depended on the e-learning materials provided by the university, which ended up taking a large portion of our class time.

In hindsight, I wish I had known more about vocabulary-building and listening apps that aren’t made by traditional textbook publishers. These apps are designed for self-study and informal learning. If I had known about them, I could have shown students a more approachable and enjoyable way of building their language skills. These tools might have helped students connect more easily with modern learning methods.

The COVID-19 crisis appears to have altered Teacher C’s attitudes towards digital technology, influencing her teaching methods. Despite the small class size, students noted the effectiveness of the “listening” component (see Table 3 and

Table 6), which may have contributed to Teacher C's belief in its efficacy for individual learning. This trend was also evident in the frequency word analysis results. The findings from the comments of Teacher C's students indicate that the students are likely impressed by Teacher C's use of technology primarily for listening exercises, and they perceive this method as effective in enhancing their listening skills.

Discussion

Research Question 1 (RQ1) guides our exploration into the potential shifts in students' mindsets toward the use of digital technologies for English language learning after course completion, and the factors that contribute to these changes. From this perspective, changes in students' mindsets observed in the present study should be interpreted not as fixed psychological traits, but as context-dependent shifts in learners' beliefs and affective orientations shaped by instructional practices and learning experiences. The findings offer significant insights. Most participants had minimal experience with digital technologies for English learning before joining the university course, as outlined in Table 1. However, their anticipations regarding the efficacy of these technologies in enhancing their language abilities were notably high, as depicted in Table 4 and Table 5. Throughout the course, we observed a generally positive shift in participants' views on learning English via digital technologies, aligning with their initial expectations, as illustrated in Table 2. By the course's conclusion, their subjective views on the effectiveness of these technologies in boosting proficiency were predominantly positive, as demonstrated in Table 5 and the reasons asked for in the second semester.

The study found that the learning method preferences of about half of participants remained relatively stable between the first and second semesters, while others experienced either positive or negative changes (see Table 7 and 8). The results also indicate a correlation between English proficiency and shifts in mindset. Students with lower English proficiency, such as those in Teacher B's class at the CEFR A1 level, found digital technologies more exciting than daunting according to the reason for their preference (B9 and B10). Numerous students in this class stressed that digital technologies enhanced their English learning experience and fostered increased participation because of easiness and usefulness to engage in learning English by using digital equipment. Consequently, digital technologies appeared to heighten their enthusiasm for learning English compared to previous levels.

The preference for digital technologies among lower-proficiency students may be explained by several interrelated factors. First, digital tools appeared to reduce anxiety by lowering the perceived difficulty of engaging with English, aligning with findings on affective variables in L2 learning (Dewaele & MacIntyre, 2016). Second, the accessibility and flexibility of mobile-based learning allowed students to engage with English in short, manageable sessions, which may have enhanced their sense of control and motivation (Lai,

2013). These features may be particularly salient for learners who previously experienced limited success with traditional, paper-based instruction.

However, students with higher English proficiency in the classes of Teachers A and C generally favored traditional, paper-based learning methods, as shown in Table 7 and 8, likely because of their past success with this style in their earlier education. Particularly, the reasons of Teacher A's students' preference introduced in the last section indicate that "writing on notebooks or textbooks", i.e., paper-based learning, must have been their main learning method since they started to learn English and it is difficult for them to change their mindset. A student of Teacher C (C7) distrusted digital technology because of glitches and instability, whereas some students resisted using digital devices to learn, claiming that it hurt their eyes (A12); a student in the lowest level class revealed that they made their vision worse (B11). These students typically continued to prefer paper-based learning after the course, suggesting that English proficiency influences participants' attitudes towards digital technology (Dashkina et al., 2022; Luef et al., 2019). This complexity underscores the value of employing qualitative research methods, such as triangulation, to gain a comprehensive understanding of language learners' psychology (Dewaele & MacIntyre, 2016; Ibrahim, 2016).

Research Question 2 (RQ2) investigated the variation in students' sentiments towards the use of digital technologies based on their English proficiency, teacher attitudes, tasks, and materials. Our analysis uncovers intriguing patterns of how these variations influenced their mindsets towards English learning with technology. The students' feedback suggests that their emotions were somewhat shaped by each teacher's method of incorporating digital technologies into the classroom, encompassing activities like vocabulary learning apps, e-learning tasks, and additional listening materials. However, all participants concurred that their attitudes towards digital technologies were contingent on their subjective or objective evaluation of their effect on proficiency.

Teacher B's remarks indicated an effort to alleviate students' apprehension toward English learning by integrating digital tasks and technology into the classroom setting. Students in this class were predominantly of the opinion that digital technologies simplified English learning and that the tasks contributed to enhancing their proficiency. Consequently, this class had the highest proportion of students expressing an interest in persisting with the use of digital technology for English learning, as demonstrated in the preliminary findings.

Conversely, Teachers A and C viewed digital technologies as primarily useful for acquiring specific skills and knowledge. Many of their students' remarks centered on the efficacy of digital technologies in vocabulary and listening comprehension. Although these students generally reported a positive shift in their attitudes and perceived effectiveness, fewer expressed a strong inclination to continue using digital technologies post-course, indicating a preference for conventional learning methods. This implies that while digital technologies were deemed effective for certain skills, students under these teachers maintained a preference for traditional learning in some areas. Therefore, despite similarities among participants, the results suggest that teachers' attitudes



towards digital technologies significantly impact students' mindset formation and change (Stockwell, 2013).

In conclusion, this research has significant implications for educators. First, it is crucial for teachers to fully comprehend the pros and cons of integrating digital technologies into English language instruction. This understanding will allow them to make well-informed choices when incorporating these technologies into their pedagogical approaches, thereby enhancing the learning experiences of students. Second, teachers should proactively guide students on how to use digital technologies effectively for autonomous learning outside the classroom. This not only equips students with the ability to use these tools but also promotes self-directed learning.

From a pedagogical perspective, the findings also suggest important implications for Japanese universities and teacher education programs. Teachers should consider tailoring the use of digital technologies to learners' proficiency levels and affective needs rather than adopting uniform approaches. For lower-proficiency learners, digital tools may function as an anxiety-reducing entry point into English learning, while higher-proficiency learners may benefit from a balanced integration of digital and paper-based methods. Furthermore, teacher training programs should emphasize not only technical skills but also reflective decision-making regarding when, how, and why digital technologies are used in language classrooms.

The study's limitations, such as potential variations in participants' interpretations of the questionnaire items and the relatively small sample size in Teacher C's class, must be recognized. However, our focus was not on the absolute validity of individual responses, but on the depiction of Japanese learners in a specific context. In this context, the trustworthiness of the relationship between the teacher-researcher and the participating learners is more significant than the reliability of the research methodology (Toyoshima, 2007, 2016, 2018, 2020, 2022, 2024).

Conclusion

This study explored the potential shift in attitudes and perceptions towards English language learning through digital technology, within the context of a CALL system-based course. Students were exposed to digital learning resources and applications, and their responses were analyzed. The qualitative findings suggest that learners' attitudes toward learning are multifaceted, encompassing a range of thoughts and emotional states that contribute to any potential change.

The study's significant discovery was that perceptions and attitudes differ based on English proficiency levels. In consideration of the Japanese context of English education, the findings suggest that learners with lower English proficiency encounter difficulties with traditional learning methods in junior and senior high school. These learners express an anticipation of digital technologies as a potential source of benefit. Conversely, learners with higher English proficiency seemed to favor traditional "analog learning," owing to their past

successes with this approach. These insights carry implications for secondary English language education.

Moreover, the attitudes and practices of the teachers in charge were found to have some impact on the shift in participants' attitudes towards digital technology. Even though university courses typically last about a year, teachers should recognize their influence and consider incorporating digital technologies, while being mindful of their advantages and disadvantages.

Note

1. Refer to the supplemental document of OECD PISA 2018 result published by National Institute for Educational Policy Research (chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.nier.go.jp/kokusai/pisa/pdf/2018/06_supple.pdf).

Acknowledgement

From 2019 to 2021, we received special funding from Tsurubunka University for a research project that included the present study. Thanks to this funding, we were able to conduct the research. We would also like to thank all the participants in the present study, as well as the Center for Language Education at Tsurubunka University. This study would not have been possible without their cooperation and support.

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Appendix A

Questions in the questionnaires (conducted in Japanese, translated by the authors)

First Semester:

FSQ1. Have you used internet applications or online materials on a PC, smart-phone, or tablet for English language learning?

- 1) I have never used these devices.
- 2) I sometimes use these devices.
- 3) I often use these devices.
- 4) I always use these devices.

FSQ2. What is your opinion of learning English using digital technology?

- 1) I don't enjoy learning with the technology or feel it was effective in improving my proficiency.
- 2) I enjoy learning with the technology, but I don't think it is effective in improving my proficiency.
- 3) I enjoy learning with the technology and feel it is somewhat effective in improving my proficiency.
- 4) I can enjoy learning with the technology very much and feel it is effective in improving my proficiency.

FSQ3. What kind of English learning method do you prefer?

- 1) I want to study only with a textbook or other paper-based materials.
- 2) I don't mind studying with technology partially, but I mainly want to use textbook or paper-based materials.
- 3) I want to study by using my favorite applications or e-learning.
- 4) I don't want to use textbook or paper-based materials, but to use only technology.

Second Semester:

SSQ1. Has your perspective on learning English changed as a result of using technology, including the internet, applications, and e-learning via PC or smartphone?

- 1) My views have not changed at all.
- 2) My views have not changed very much.
- 3) My views have changed in some parts.
- 4) My views have changed very much.

SSQ2. Please provide an honest reason for the answer to question SSQ1.

SSQ3. Did using technology enhance your English proficiency?

- 1) It is not effective at all.
- 2) It is not very effective.
- 3) It is somewhat effective.
- 4) It is very effective.

SSQ4. Please provide an honest reason for the answer to question SSQ3.

SSQ5. Which English learning methods do you prefer?

- 1) I want to study only with a textbook or other paper-based materials.
- 2) I don't mind studying with technology partially, but I mainly want to use textbook or paper-based materials.
- 3) I want to study by using my favorite applications or e-learning.
- 4) I don't want to use textbook or paper-based materials, but to use only technology.

SSQ6. Please provide an honest reason for the answer to question SSQ5.